

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 11-212940

(43)Date of publication of application : 06.08.1999

(51)Int.Cl.

G06F 15/163  
G06F 13/00  
H04L 12/56

(21)Application number : 10-013674

(71)Applicant : NTT DATA CORP  
SUMITOMO BANK LTD

(22)Date of filing : 27.01.1998

(72)Inventor : FUJIWARA TOOSHI  
KUWADA TAKASHI  
YAMAMOTO HIDEAKI  
MASUKI RYOSUKE  
UCHIKAWA ATSUSHI  
ICHIKI NOBUHIKO

(54) MULTICAST SYSTEM AND METHOD, AND NETWORK ACTOR AND NODE ACTOR FOR THE SYSTEM

(57)Abstract:

PROBLEM TO BE SOLVED: To perform a multicast to a specific object group in a network with little traffic.

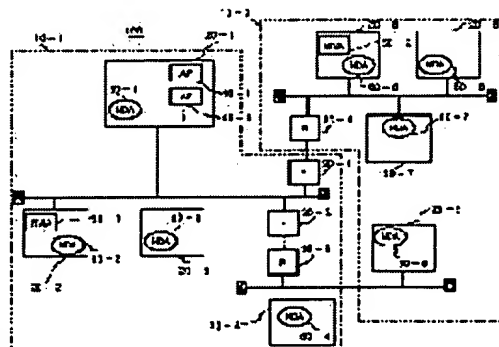
SOLUTION: Logical networks 10-1 and 10-2 are defined regardless physical network constitution. Network actors 50-1 and 50-2 are arranged at one of nodes 20-2 and 20-6 in the respective logical networks 10-1 and 10-2 to manage distribution paths led to the nodes during operation on the respective logical networks. Then, node actors 60-1, 60-2 are arranged at the individual nodes 20-1, 20-2... to manage the domain names as well as the distribution paths led to AP(application) objects

(processes) 40-1, 40-2... while the whole in those nodes

are operated. When a message is multicast to a

process group belonging to the specific domain, the

message is set to the network actor on the same logical network from its originating process.



Then, the message is sent to the all node actors during operation from the said network actor and then, sent to the process during operation that is adapted to a designated domain.

---

## LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

Copyright (C); 1998,2003 Japan Patent Office

\* NOTICES \*

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

CLAIMS

---

[Claim(s)]

[Claim 1] A network, two or more nodes arranged in said network, and two or more objects which are arranged at said all or a part of two or more nodes, and can participate in a predetermined domain, respectively, It is arranged according to an individual at each node. The 1st distribution pass to each of the object under operation in each node, Node AKUTA which knows the domain where each of the object under said operation has participated, It is arranged at one predetermined node and has network AKUTA which knows the 2nd distribution pass to each of node AKUTA to which it is working on said network. It has a means by which the transmitting agency object of said two or more objects transmits a message including assignment of a transmission place domain to said network AKUTA. Said network AKUTA Said message is received and it has the 1st distribution means which distributes said message to said all node AKUTA under operation using said 1st distribution pass. Said each node AKUTA The multicast method which has the 2nd distribution means which distributes said message using the 2nd distribution pass only to the object which has participated in the transmission place domain specified among said objects under operation in the same node in response to said message.

[Claim 2] The multicast method according to claim 1 whose configuration of a physical network is the logic network where said network was defined logically independently.

[Claim 3] The multicast method according to claim 1 with which temporary pass is stretched between a said transmitting former object and said network AKUTA when a said transmitting former object transmits said message, and said temporary pass is immediately cut after transmission of said message.

[Claim 4] It is the multicast method according to claim 1 which said 1st distribution pass is stretched between said each node AKUTA and said network AKUTA when said each node AKUTA starts, and is held until said each node AKUTA ends said 1st distribution pass.

[Claim 5] The multicast method according to claim 4 with which said each node AKUTA notifies said 1st distribution pass of its that to said network AKUTA when said each node AKUTA starts.

[Claim 6] It is the multicast method according to claim 1 which said 2nd distribution pass is stretched between said each object and said node AKUTA when said each object starts in said each node, and is held until said each object ends said 2nd distribution pass.

[Claim 7] The multicast method according to claim 4 with which said each object notifies said the 1st distribution pass and said domain of its that to said node AKUTA when said each object starts.

[Claim 8] Said message can include assignment of the object of a transmission place, a node, and a domain. The 1st distribution means of said network AKUTA Although the message which received includes assignment of a specific domain, when assignment of a specific node is not included, When said message which received is distributed to all node AKUTA under operation and the message which received, on the other hand, includes assignment of a specific specific node, It distributes only to node AKUTA of the node which had said message which received specified. The 2nd distribution means of each of said node AKUTA Although the message which received includes assignment of a specific domain, when assignment of a specific object is not included, When it distributes to all the objects under operation which has participated in the domain which had said message which received specified and

the message which received, on the other hand, includes assignment of a specific specific object, The multicast method according to claim 1 distributed only to the object which had said message which received specified.

[Claim 9] It is arranged at the node on a network. The distribution pass to each of the object under operation in said node, Know the domain where each of the object under said operation has participated, and a message including assignment of a transmission place domain is received. Node AKUTA which has a distribution means to distribute said message using said distribution pass, only to the object which has participated in the transmission place domain specified among said objects under operation in said node.

[Claim 10] Said distribution means is node AKUTA according to claim 9 which distributes to all the objects under operation which has participated in the domain which had said message which received specified when assignment of a specific object is not included, although the message which received includes assignment of a specific domain, and distributes only to the object which had said message which received specified when the message which received, on the other hand, includes assignment of a specific specific object.

[Claim 11] It is arranged at the node on a network. The distribution pass to each of the object under operation in said node, Know the domain where each of the object under said operation has participated, and a message including assignment of a transmission place domain is received. Only to the object which has participated in the transmission place domain specified among said objects under operation in said node as node AKUTA which has a distribution means to distribute said message using said distribution pass The record medium which supported the computer program in order to operate a computer and in which computer reading is possible.

[Claim 12] Network AKUTA which has a distribution means to have been arranged at the node on a network, to know the distribution pass to each of the node to which it is working on said network, to receive a message, and to distribute said message to said all nodes under operation using said distribution pass.

[Claim 13] Said distribution means is network AKUTA according to claim 12 which distributes said message which received to all node AKUTA under operation when assignment of a specific node is not included, although the message which received includes assignment of a specific domain, and is distributed only to node AKUTA of the node which had said message which received specified on the other hand when the message which received includes assignment of a specific specific node.

[Claim 14] The record medium which supported the computer program as network AKUTA which has a distribution means to have been arranged at the node on a network, to know the distribution pass to each of the node to which it is working on said network, to receive a message, and to distribute said message to said all nodes under operation using said distribution pass in order to operate a computer and in which computer reading is possible.

[Claim 15] In the approach of multicasting a message among two or more objects which are arranged at two or more nodes on a network, and can participate in a predetermined domain, respectively Node AKUTA arranged according to the individual at each node The 1st distribution pass to each of the object under operation in each node, The step which gets to know the domain where each of the object under said operation has participated, The step to which network AKUTA arranged at one predetermined node gets to know the 2nd distribution pass to each of node AKUTA to which it is working on said network, The step at which the transmitting agency object of said two or more objects transmits a message including assignment of a transmission place domain to said network AKUTA, The step to which said network AKUTA receives said message and distributes said message to said all node AKUTA under operation using said 1st distribution pass, The multicast approach of having the step to which said each node AKUTA distributes said message using the 2nd distribution pass only to the object which has participated in the transmission place domain specified among said objects under operation in the same node in response to said message.

[Translation done.]

\* NOTICES \*

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

DETAILED DESCRIPTION

---

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the multicast method for sending the same message to the specific process (object) group on a communication network.

[0002]

[Description of the Prior Art] When sending a message to the specific multiple-processes group on a network (process group belonging to one specific operating group), two kinds of approaches as follows are used conventionally.

[0003] IP broadcast address is used for a one-eyed approach, a packet is transmitted to all the nodes on a network (host), and the process of a receiving side is the approach which receives the packet, or has canceled enough if needed, and is carried out. For example, the message is broadcast to all nodes, only the operating group's A process receives it and other operating groups' process cancels to distribute a message only to the operating group's A process, as shown in drawing 1.

[0004] The 2nd approach is approaches by the unicast of transmitting a message according to an individual to each process simply.

[0005]

[Problem(s) to be Solved by the Invention] There are the following problems in the approach by IP broadcasting. To the 1st, traffic will increase by IP broadcasting. Every time IP broadcasting straddles a router and the gateway to the 2nd, it cannot be transmitted to it. An excessive load will be covered over the 3rd to the process which does not need the message.

[0006] There are the following problems in the approach by the unicast. Definition information must also be corrected, if the definition information which shows the location of the node which each process of a distribution place starts is required for the 1st in advance and there are modification of network configuration, modification of node arrangement, an addition, deletion of a process, etc. Since it is not concerned with whether a partner's process has started the side which carries out the cast to the 2nd but transmission is tried, when there are many especially processes of a partner and many of them have not started, the futility of transmission will increase.

[0007] Therefore, the purpose of this invention is to enable it to perform the multicast to the specific process group on a network by the fewest possible traffic.

[0008] Another purpose of this invention is in a \*\*\*\*\* multicast about a router or the gateway to make it possible.

[0009] Still more nearly another purpose of this invention is to offer a multicast method with little transmitting futility.

[0010]

[Means for Solving the Problem] By the multicast method according to this invention, on the network, two or more nodes are arranged, two or more objects are arranged at all or a part of node of these plurality, and each object can participate in a predetermined domain. Node AKUTA has been arranged according to an individual at each node, and each node AKUTA knows the distribution pass to each of

the object under operation in its node, and the domain where each of the object under the operation has participated. Moreover, network AKUTA has been arranged at one predetermined node on a network, and network AKUTA knows the distribution pass to each of node AKUTA which is working on the network. If an object to multicast a message as can be transmitted to network AKUTA and does so a message including assignment of the domain of a transmission place, network AKUTA will distribute the message to all node AKUTA under operation on a network. Then, each node AKUTA distributes the message only to the object which has participated in the transmission place domain specified among the objects under operation in its node.

[0011] Thus, the multicast of the message is carried out to the object group which has participated in the domain specified by a transmitting agency object. As opposed to the node or object which are not working, a useless message delivery is not performed to the object which has not participated in the appointed domain even if it is working in that case.

[0012] The configuration of a physical network of the above-mentioned network may be the logic network defined logically independently. Therefore, the distribution over a router or the gateway is possible.

[0013] Desirably, the object which is going to transmit a message stretches temporary pass to network AKUTA, transmits a message to each time of transmission, and cuts temporary pass immediately after transmission. Moreover, desirably, the distribution pass between each node AKUTA and network AKUTA is stretched to the starting timing of each node AKUTA, and it is held until each node AKUTA is completed. Therefore, whenever each node AKUTA starts network AKUTA, it gets to know the distribution pass to each node AKUTA. Desirably, the distribution pass between each object within each node and node AKUTA is stretched to the starting timing of each object, and it is held until each object is completed. Whenever each object starts node AKUTA, it gets to know the distribution pass to each object. The domain of each object is also desirably notified to node AKUTA at the time of starting of each object. By carrying out like this, it can respond flexibly to modification of a network configuration, node arrangement, etc. and the addition of an object, and deletion.

[0014] The distribution means of network AKUTA distributes the message which received when assignment of a specific node was not included, although the message which received included assignment of a specific domain to all node AKUTA under operation desirably, and on the other hand, when the message which received includes assignment of a specific node, it distributes it only to node AKUTA of the node which had the message which received specified. Moreover, the distribution means of each node AKUTA distributes desirably to all the objects under operation which has participated in the domain which had the message which received specified when assignment of a specific object was not included, although the message which received included assignment of a specific domain, and when the message which received includes assignment of a specific specific object, on the other hand, it distributes only to the object which had the message which received specified. Thereby, distribution of a different pattern, such as a message delivery not only to the multicast to the object group of a specific domain but the object in a specific node and a message delivery to the specific object in a specific domain, is also attained.

[0015] Network AKUTA and node AKUTA which were mentioned above also offer this invention again. Although network AKUTA and node AKUTA are typically carried out by activation of the software by the computer, a computer can be provided with the computer program for it through media, such as various kinds of disk mold storage and various kinds of semiconductor memory, and a communication network.

[0016]

[Embodiment of the Invention] Drawing 1 shows the rough whole configuration of 1 operation gestalt of the multicast method according to this invention.

[0017] A certain communication network 100 is constituted as the aggregate of the physical network segment of a large number which interconnected by the router 30-1, 30-2, --, etc. On this communication network 100, one or more logic networks 10-1, 10-2, and -- are defined. Many nodes (= host) 20-1, 20-2, and -- are usually contained in each logic network 10-1, 10-2, and --.

[0018] Each of a node 20-1, 20-2, and -- has one or the application (AP) object (= process) 40-1 of the number beyond it, 40-2, and -- (in drawing 1, illustration of AP object in the node of others other than node 20-1 is omitted). Although the AP object 40-1, 40-2, and -- perform processing in connection with specific business, respectively, they have participated in either of some operating groups who was beforehand defined according to the class or the contents of business. for example, the AP object 40-1 participates in the operating group who searches a specific database, and another AP object 40-2 participates in the operating group who calculates -- as -- it comes out. Each operating group is called a domain. In addition, although this operation gestalt defines the domain according to the class or the contents of business, this is only an example on explanation. Of course, it does not matter even if it defines a domain from another viewpoints (for example, the viewpoint of cost, the viewpoint of a management gestalt, the viewpoint of processing speed, etc.).

[0019] Drawing 2 shows the logical configuration of this system. The symbol which connected the rhombus and black dot in drawing with the line expresses with one element by the side of a rhombus mark the affiliation relation of "one-pair N" that the element by the side of a black dot mark is carrying out N individual (one or more) affiliation.

[0020] The logic network 10 is the aggregate of many nodes 20 currently installed in the physical network. This logic network 10 is defined logically and is unrelated to the definition of a physical segment configuration, LAN/WAN, etc. Within one node 20, one or more AP objects 40 operate. Therefore, each AP object 40 belongs to one network 10 and one node 20. Moreover, one or more AP objects 40 have participated in one domain 70. However, each AP object 40 does not necessarily need to participate in a domain 70. That is, the AP object 40 belonging to no domain may exist.

[0021] Drawing 1 is referred to again. In each logic network 10-1, 10-2, and --, the daemon process called network AKUTA (NWA) to one predetermined node is arranged. For example, in the logic network 10-1, network AKUTA 50-1 is arranged at a node 20-2, and network AKUTA 50-2 is arranged in the logic network 10-2 at the node 20-6. This network AKUTA 50-1, 50-2, and -- perform message delivery control of the whole in each logic network 10-1, 10-2, and --.

[0022] Moreover, the daemon process 60-1 called node AKUTA (NDA), 60-2, and one -- are arranged at each node 20-1, 20-2, and each --. This node AKUTA 60-1, 60-2, and -- perform message delivery control within each node 20-1, 20-2, and --.

[0023] Drawing 3 shows concretely the function of network AKUTA 50 and node AKUTA 60.

[0024] The AP object 40 which wants to multicast a message as AP object group which has participated in the specific domain stretches the temporary pass 81 at every distribution to network AKUTA 50 on the logic network to which he belongs, and sends out the message. Pass 81 is immediately cut after sending out.

[0025] Between network AKUTA 50 and each node AKUTA 60 on the logic network 10 to which it belongs, it is the starting (typically machine boot) timing of the node AKUTA 60, and is \*\*\*\*\* about the distribution pass 83. And it is the termination (typically shutdown of machine) timing of the node AKUTA 60, and each distribution pass 83 is cut. Working [ of the node AKUTA 60 ] and its distribution pass 83 are stretched.

[0026] Network AKUTA 50 has the node AKUTA table 51 for managing the node 20 under operation on the logic network 10 to which it belongs on the memory of the network AKUTA 50. The node name of the node 20 under all operation on that logic network 10 and the identification number (a distribution path ID, for example, a file descriptor) of the distribution pass 83 to that node 20 are registered into this node AKUTA table 51 so that it may illustrate to drawing 4. When each node AKUTA 51 starts, based on delivery and this notice of starting, network AKUTA 50 can register into the node AKUTA table 51 that node name and distribution path ID of node AKUTA 60 that were started to network AKUTA 50 for the notice of starting whose node AKUTA 60 of that showed its own node name and distribution pass.

[0027] Network AKUTA 50 which received the message by which a multicast should be carried out from the AP object 40 to the specific domain distributes the message to all node AKUTA 60 under operation with reference to the node AKUTA table 51 on the logic network 10.

[0028] Between node AKUTA 60 and each AP object 40 in the same node, the distribution pass 85 is stretched to the starting timing of the AP object 40. And the distribution pass 85 is cut to the termination timing of the AP object 40. Working [ of the AP object 40 ] and its distribution pass 85 are stretched.

[0029] Node AKUTA 60 has AP object management domain table 61 and 63 for managing the AP object 40 under operation on the same node as it. The object name of all the AP objects 40 under operation and the distribution path ID of the distribution pass 85 to the AP object 40 under the operation are registered into the AP object table 61 within the node so that it may illustrate to drawing 5. The object name of all the AP objects 40 under the operation and the name (domain name) of the domain where the AP object 40 under the operation has participated are registered into the domain table 63 so that it may illustrate to drawing 6 R> 6. When each AP object 40 starts, based on delivery and this notice of starting, node AKUTA 60 can register into AP application table 61 and the domain table 63 that object name and distribution path ID of the AP object 40 that were started to node AKUTA 60 for the notice of starting whose AP object 40 of that showed its object name, distribution pass, and domain name.

[0030] Node AKUTA 60 which received the message by which a multicast should be carried out from network AKUTA 50 to the specific domain distributes the message with reference to the AP object table 61 and the domain table 63 only to the AP object 40 under operation which has participated in the specified domain.

[0031] Drawing 7 shows the format of the message sent out from the AP object 40.

[0032] The header 91 showing the information for communications control and the user data 93 which are the contents of the net of a message are contained in the packet of a message 90. The object name which shows the AP object 40 of a transmitting agency, the network name, the node name and the domain name, and the object name which shows AP object name 40 of a transmission place, a network name, a node name and a domain name are contained in the header 90.

[0033] The AP object 40 which wants to multicast a message as AP object group which has participated in the specific domain sets the name of the specific domain to the transmission place domain name of the header 91 of a message 90. No data are set to the transmission place object name and transmission place node name of a header 91 at this time (= NULL data are set). As this message is illustrated to drawing 8, a multicast is carried out to it.

[0034] The example of drawing 8 assumes the case where the AP object 40-1 multicasts a message as AP object group which has participated in the specific domain D1. The arrow head in drawing shows the flow of a message. The AP object 40-1 of a transmitting agency stretches the temporary pass 81 to network AKUTA 50-1 on the logic network to which he belongs, and transmits a message to the network AKUTA 50-1. "D1" is set to the header 91 of this message as a transmission place domain name. Network AKUTA 50-1 which received the message distributes the message to all node AKUTA 60-1 under operation, 60-2, and 60-3 on the same logic network. Each node AKUTA 60-1 which received the message, 60-2, and 60-3 distribute the message in AP object under operation in the same node only to the AP application 40-2 which has participated in the specified domain D1, 40-3, and 40-6, respectively.

[0035] The multicast of the message is carried out only to AP object which has participated in the specific domain as mentioned above. The AP application 40-1 of a transmitting agency should transmit a message only once in that case. On a logic network, the message is sent only to the node under operation. Within a node, the message is sent only to AP object which has participated in the domain which was working and was specified. According to this multicast method, as compared with the approach by the conventional IP broadcasting, traffic does not apply a burden few and excessive to AP object with that message unnecessary [ ending ]. Furthermore, since a logic network can give a definition regardless of a physical segment configuration ranging over a router or the gateway, the message delivery over a router or the gateway is possible. Moreover, as compared with the approach by the conventional unicast, to modification of 1 etc., the addition of AP object, and deletion, it can respond more flexibly and a network configuration or a network node do not perform useless transmission to the node or object under pause.

[0036] Although the case where a transmitting agency AP object multicasted above to the object group of the specific domain on the logic network to which he belongs was explained, the cast of other patterns is also possible.

[0037] For example, although a transmission place network name is specified in a message header 91, the object name, node name, and domain name of a transmission place can distribute a message to AP object during all operation in a logic network by not specifying. Moreover, although the network name and node name of a transmission place are specified, the object name and domain name of a transmission place can distribute a message to AP object during all operation in the specified node by not specifying. Moreover, although the network name, node name, and domain name of a transmission place specify, the object name of a transmission place can distribute a message only to AP object by not specifying during the operation which has participated in the domain specified in the specified node. Moreover, a message can be feared by specifying the object name, network name, and node name of a transmission place only in one object specified in the specified node. Furthermore, if the location of network AKUTA on another logic network is known, the cast of the message can be carried out by the above various patterns also to AP object on the another logic network.

[0038] The above-mentioned operation gestalt is an example of this invention, and can carry out this invention also with the other various gestalten.

[0039] For example, since it can be independently defined as a network physical configuration logically, a logic network can also be set up so that a certain logic networks may overlap in other logic networks and some fields. Then, AP object which exists in the lap field will belong to two or more logic networks. Moreover, there may be a domain and a thing (for example, it participates in the both sides of a computation domain and a high-speed processing domain) which one AP object 40 also participates in two or more domains 70 since a definition can be given freely. Also in such a case, this invention is applicable without a problem.

[0040] Moreover, for example, a short-range logic network can also be defined in one logic network of a wide area. In that case, one network AKUTA can be arranged to each of those networks, respectively, distribution pass can be stretched between network AKUTA of a wide area, and short-range network AKUTA, and the system of hierarchical network AKUTA that network AKUTA of a wide area manages the distribution path ID of short-range network AKUTA can be adopted.

---

[Translation done.]

\* NOTICES \*

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

## DESCRIPTION OF DRAWINGS

---

### [Brief Description of the Drawings]

[Drawing 1] The block diagram having shown the rough whole configuration of 1 operation gestalt of this invention.

[Drawing 2] The block diagram having shown the notional configuration of this operation gestalt.

[Drawing 3] The block diagram having shown concretely the function of network AKUTA 50 and node AKUTA 60.

[Drawing 4] Drawing having shown an example of a node AKUTA table.

[Drawing 5] Drawing having shown an example of AP object table.

[Drawing 6] Drawing having shown an example of a domain table.

[Drawing 7] The data format Fig. having shown the configuration of the message sent out from the AP object 40.

[Drawing 8] The block diagram having shown the hierarchy of the message delivery to a specific domain.

### [Description of Notations]

10 Logic Network

20 Node

40 AP Application (Process)

50 Network AKUTA (NMA)

51 Node AKUTA Table

60 Node AKUTA (NDA)

61 AP Object Table

63 Domain Table

70 Domain (Operating Group)

81 Temporary Pass

83 Distribution Pass

90 Message

91 Header

93 User Data

---

[Translation done.]

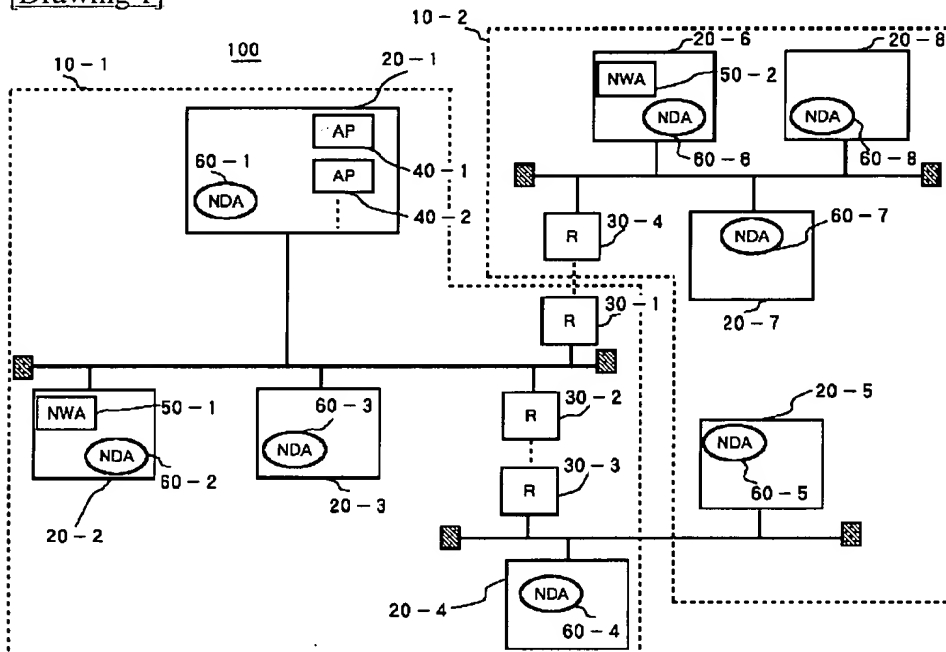
## \* NOTICES \*

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

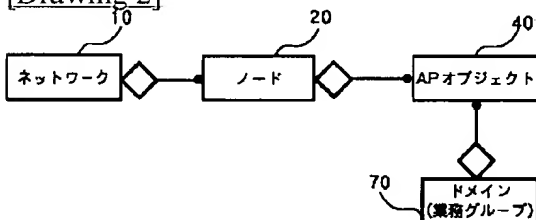
1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

## DRAWINGS

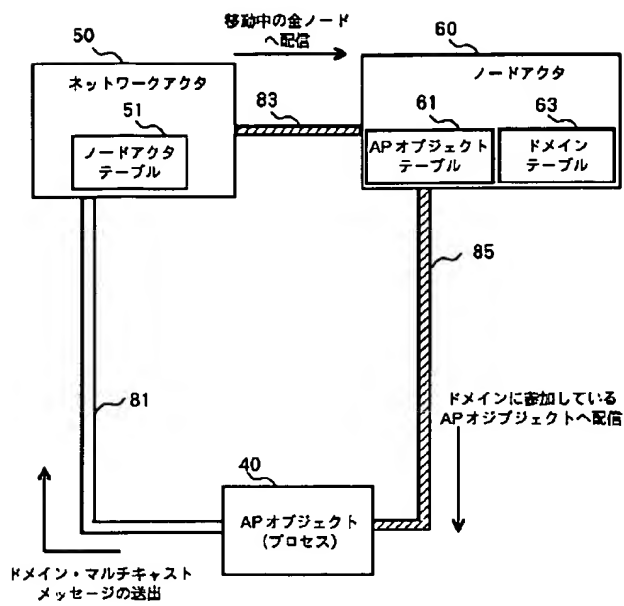
[Drawing 1]



[Drawing 2]



[Drawing 3]



[Drawing 4]

ノード名	配信バスID
ND 1	5
ND 2	7
ND 3	8
⋮	⋮

51

[Drawing 5]

オブジェクト名	配信バスID
AP 1	4
AP 2	9
AP 3	5
⋮	⋮

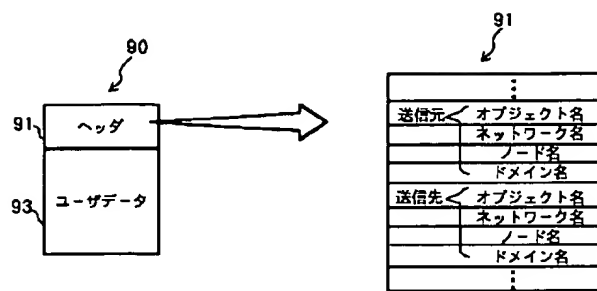
61

[Drawing 6]

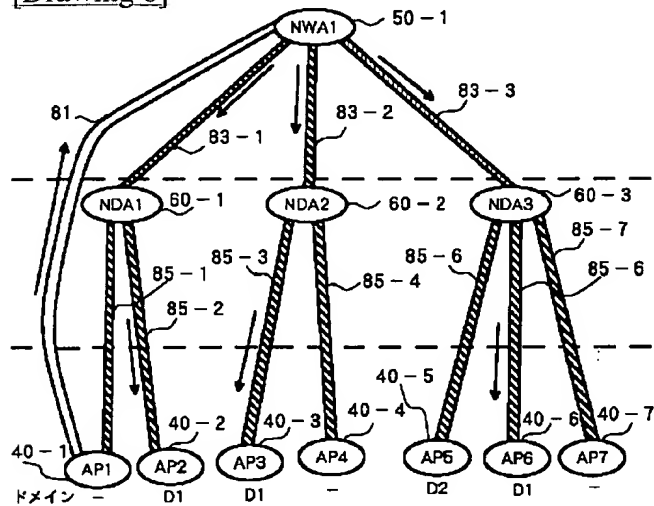
オブジェクト名	ドメイン名
AP 1	D1
AP 2	D1
AP 3	-
⋮	⋮

63

[Drawing 7]



[Drawing 8]



[Translation done.]